DOCUMENT RESUME

ED 319 950 CE 054 905

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TITLE Improving General and Vocational Education in the High Schools. SREB-State Vocational Education Consortium Approaches for Achieving Gains in the Mathematics, Science, and Communications Competencies of Students in General and Vocational Programs.
INSTITUTION Southern Regional Education Board, Atlanta, Ga.
PUB DATE 89
NOTE 40p.
AVAILABLE FROM Southern Regional Education Board, 592 Tenth Street, N.W., Atlanta, GA 30318-5790 ($6.50).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Education; *Articulation (Education); *Board of Education Policy; Certification; Course Selection (Students); *Educational Improvement; High Schools; *Integrated Curriculum; Job Placement; Mission Statements; Staff Development; Standards; Underachievement; *Vocational Education
IDENTIFIERS *Performance Indicators

ABSTRACT

Recommendations for improving general and vocational education in the high schools are as follows: (1) providing clearly stated state and local school board policies establishing the purpose of vocational education; (2) upgrading the content of vocational courses; (3) providing students with access to higher level academic content taught through an applied approach; (4) requiring students to complete a coherent multiyear program of vocational and academic studies that prepares them for either an employment or educational setting; (5) providing underachieving students with access to vocational programs and academic courses and the continued extra assistance they need to succeed; (6) developing the linkage between secondary and postsecondary education and training so that academic and vocational courses enable students to pursue further education successfully; (7) providing students with assistance in course selection and planning; (8) providing staff development programs to promote the academic competencies of vocational teachers and the applied teaching skills of academic teachers; (9) revising the preparation and certification requirements for new vocational teachers; (10) expanding efforts to place graduates in related employment or in postsecondary educational opportunities; and (11) establishing performance indicators to track and report the annual progress of each school district. (An appendix provides recommended high school curricula for automotive, health and related fields, secretarial and administrative support, and manufacturing production trades.) (CML)

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Linking Vocational and Academic Education

SREB-State Vocational Education Consortium

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# IMPROVING GENERAL AND VOCATIONAL EDUCATION IN THE HIGH SCHOOLS

## SREB-State Vocational Education Consortium Approaches for Achieving Gains in the Mathematics, Science, and Communications Competencies of Students in General and Vocational Programs

Gene Bottoms and
Alice Presson

CE054905

Southern Regional Education Board
592 Tenth Street, N.W. • Atlanta, Georgia 30318-5790 • 1989 • $6.50

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THE SREB-STATE VOCATIONAL
EDUCATION CONSORTIUM

Dedicated to Strengthening the Basic Competencies of
Students Enrolled in Vocational Education Programs

Alabama, Arkansas, Florida, Georgia, Kentucky,
Louisiana, Maryland, Mississippi, North Carolina,
Oklahoma, South Carolina, Tennessee,
Virginia, and West Virginia

In collaboration with
Southern Regional Education Board
and
The National Center for Research in
Vocational Education

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## FOREWORD

More than half of the high school students in America are in general and vocational programs. How well these students perform in high school, and later, will determine in good measure how well America performs in our increasingly competitive global economy. Most of these students may have the capacity to achieve more than is expected currently. In fact, students in general and vocational programs have demonstrated that they can master higher level mathematics, science, and language arts. Students are mastering these higher level competencies when they use them to perform real tasks and to solve real problems.

Whether high school students are in college preparatory, general, or vocational programs, they need the ability to interpret successfully what they read, solve work-related mathematics and science problems, and make clear-out decisions. The aim should not be to teach higher level competencies to some students and lower level competencies to others. Instead, our aim should be to use different ways of teaching to challenge and to help more students achieve higher level competencies. We must stress differences in the ways students learn mathematics, science, and language arts, not differences in what student learn about them.

How can you stress the differences in the ways students learn instead of differences in what they learn?

You can--

- o Design courses to teach essential content from college preparatory courses in mathematics, science, and language arts through an applied process for students in vocational and general programs;

- o Create a coherent and challenging program of vocational and academic courses that prepares youth for immediate employment or for postsecondary education while increasing their motivation and learning;

- o Revise vocational education programs to place a high priority on developing basic academic skills that can help produce high school graduates with the necessary skills for further learning on the job or in formal education programs.

Improving general and vocational education in high schools of the Southern Regional Education Board (SREB) states is the guiding principle of the SREB-State Vocational Education

Consortium.* This Consortium was formed to develop, apply, evaluate, and advance approaches to strengthen students' basic competencies in communications, mathematics, and science, and their critical thinking and problem-solving abilities. Today over three dozen pilot sites in 14 SREB states, working with state vocational, governmental, and business leaders are committed to this.

"Improving General and Vocational Education in the High Schools" is based on what we have learned from teachers and administrators in their efforts to improve the academic competencies of students enrolled in general and vocational courses. The SREB plan of action is based on visits to over 25 high schools; interviews with several hundred students, teachers, and administrators; an examination of over 2,700 transcripts of high school graduates in 1988 from the general and vocational curriculum; assessment of over 3,100 vocational completers on science; and follow-up information on over 1,700 vocational graduates one year after completing high school.

This SREB report focuses on improving the secondary school experience for those students spending most of their time in academic and vocational courses labeled "general" or "basic." The recommendations are based on the assumption that *all* high school students need a structured and demanding program of study. We have found that the general academic curriculum, as it is now carried out in most high schools, is inadequate for preparing youth for either jobs or further learning. The following recommendations are further described in this report.

- Students pursuing a vocational major should be required to complete a vigorous and coherent program combining academic and vocational study.

- Students in the general curriculum for whom the pursuit of a vocational major is inappropriate should be expected to complete an upgraded program of study requiring them to study one or more of the academic areas in depth.

Our primary goal is to urge leaders in states and local school districts to re-examine the action needed to raise the academic and technological literacy of high school graduates. This need for change is dictated by a change in the work place--*learning* is replacing physical labor as a new form of work as our society and industry become technologically sophisticated and an information-centered economy.

Mark D. Musick, President
Southern Regional Education Board

*In 1987, 13 SREB member states (Alabama, Arkansas, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Virginia, West Virginia) formed the SREB-State Vocational Education Consortium. In 1988, Louisiana became the fourteenth state to join the Consortium.

*By the year 2000--*

> *Significant gains will be achieved in the mathematics, science, and communications competencies of high school graduates from the general and vocational curriculum.*

*Goals for Education*
**CHALLENGE 2000**
*Southern Regional Education Board, 1988*

## Need for Improving General and Vocational Education

The Economic Necessity for Improvement

"Today you have to know more to advance to a good job.
Tomorrow you will have to know even more."

Mark D. Musick, President
Southern Regional Education Board

A dramatic upgrading of the educational requirements for jobs is underway in America. International competition and new technologies dictate the need for a well-educated work force. Participative management, sophisticated quality control, decentralized and "just-in-time" production methods and services, and increased use of information-based technologies are now common practices in both large and small businesses. These changes have increased the autonomy, responsibilities, and value of personnel at all organizational levels, which, in turn, call for workers with higher levels of academic competencies and broader technical knowledge. The rise in educational requirements for employment led the National Assessment of Educational Progress in 1985 to declare an eleventh grade achievement level as the literacy standard for the information age. The economic necessity for improvement is apparent when the achievements in mathematics, reading, and science of American youth are compared with those of youth from other countries with whom America competes time and time again. American students are found to have significantly lower achievement on academic competencies than their counterparts from other developed countries.

Increasingly, employers in the Southern Regional Education Board (SREB) member states* and across the nation are contending that many new workers have inadequate basic skills in mathematics. Employers' observations were validated by a recent survey of over 1,700 vocational graduates from 13 Southern states one year after high school graduation. One in four of the graduates reported the need for more emphasis on reading and writing technical material and using mathematics in their vocational program; four in ten reported the need for more emphasis on use of scientific principles. Yet, the current situation--too few well-educated and trained individuals looking for their first job--will worsen unless action is taken very soon. Between 1986 and the year 2000, it is projected that the economy in SREB states will create 10 million new jobs. Over 85 percent of those jobs will require at least a high school education and more than 60 percent will require training and education beyond high school.

As more jobs require mental agility rather than physical strength and manual dexterity, the problem is further compounded by demographic trends. First, there will be a decline between now and the year 2000 in the number of 18- to 25-year-olds--the normal ages for entering the job market. Second, a larger proportion of these young persons will be from backgrounds that historically have not reached educational levels adequate to meet the challenges of the projected labor market. To avoid a serious job-skills mismatch, new approaches are needed to reach those students who have a high potential for dropping out of school and the approximately two out of three students who graduate but are not in the college preparatory curriculum.

A New Approach Is Needed

One approach for raising the academic competencies of students is to change the relationship between academic and vocational education in high schools. Recent studies suggest concepts are taught more effectively when *learning to know* and *learning to do* are linked. Allowing students to use academic materials to perform "real life" tasks or address "real life"

*Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia

problems is appealing as a method for increasing students' motivation to learn higher level academic concepts in high school.

Vocational education can provide the natural setting in which to create new connections between academic skills and the uses of that learning. For many reasons, the full potential of the vocational classroom has not been developed. One reason is that educators and policymakers have tended to think of vocational education as strictly procedural, or "hands on" learning, rather than a setting in which reading, writing, mathematics, and science knowledge can be increased through use in the context of the problems and tasks of a vocational field of study. As a result, an important resource and a major educational investment is being under-utilized.

Research supports the idea that changing the relationship between vocational and academic education can improve student achievement. However, the evidence also suggests that this will require fundamental changes in the way high schools operate. Because attitudes and behaviors are firmly entrenched, one should not underestimate the time required to create new relationships between academic and vocational education.

The Need for a Revised Vocational Curriculum

Recent regional and national studies show that well-designed vocational courses can raise academic achievement. The impact is greatest when vocational courses are designed purposefully to reinforce higher level academic competencies in problem-solving, comprehension, science, and mathematics. While some states have successfully integrated academic content into some vocational courses, unfortunately, many vocational courses in high school are now "pitched" at an instructional level that provides little or no reinforcement for further development of higher level academic competencies. This situation persists because *neither local nor state school board policies have clearly stated that a primary purpose of vocational education is to advance students' academic competencies.* A recent survey of over 1,700 educators (vocational and non-vocational) in 14 Southern states revealed no consensus about the primary purpose of vocational education. In the same survey, three of four vocational teachers reported that they are inadequately prepared to reinforce academic competencies

strengthen vocational programs have involved *intensive staff and curriculum development.* While developing vocational courses that reinforce academic skills can result in some achievement gains, changes in the general curriculum are required to reach the levels of achievement needed.

Need for a Revised General Academic Curriculum

Vocational and general students take about three fewer "academic" courses than those in college preparatory programs. This fact only hints at a more serious problem. Studies and reports suggest that a significant proportion of students in vocational and general studies receive little counseling on the courses they should be taking. Too often these students are allowed to "graze over the field" of less demanding academic courses and an odd assortment of very basic, low-level, and frequently unrelated vocational courses. The problem is two-fold. Unlike the standards established for graduates of college preparatory programs, *state and local policies have not required vocational graduates to complete a prescribed sequence of mathematics and science courses needed to be an educated worker. Furthermore, state and local policies have allowed graduates from the general curriculum to complete high school without pursuing in-depth study in either an academic or vocational program.* Thus, many high school graduates are unprepared for continuing to learn in either an employment or postsecondary education setting. Since 1980, a higher percentage of these high school graduates have entered postsecondary vocational education, but a greater proportion are failing to earn a degree or certificate.

Evidence from recent studies suggests that secondary courses labeled "general" or "basic" result in little or no gain in achievement in mathematics and science. Studies also show that courses designed to teach essential academic content from core college preparatory courses through an applied process can serve to raise students' expectations, motivation, and achievement and simultaneously can better prepare students for employment and postsecondary education.

The Need for Higher Expectations

In many high schools too little is expected of general and vocational students by administrators, counselors, and teachers. Schools vary greatly in the level of academic courses they expect vocational students to take. For example, the preparation of vocational graduates from 34 high schools completing Algebra I ranged from 34 percent in one school to 95 percent at another. The student body from these two schools had similar socioeconomic backgrounds. Differences also exist among schools in what is expected of vocational students in their classes. For example, the percent of vocational graduates reporting having to do no homework outside of school ranged from 4 percent at one school to a high of 55 percent at another school. It appears that too little is being expected of students enrolled in courses labeled "general" or "basic." In fact, when asked, a majority of students pursuing vocational studies say that too little is expected of them in both their academic and vocational courses. This can be changed. Throughout the South, many schools are adopting well-developed "applied academic" courses (principles of technology, applied mathematics, etc.) and revising instructional strategies and materials used in existing courses to establish higher standards and expectations for general and vocational students. These schools have discovered that many more high school students can master essential content from the college preparatory curriculum if they are encouraged and allowed to enroll in these courses, if special efforts are made to teach abstract concepts through an applied and functional approach, if students are given needed extra assistance and encouragement, and, most important, if teachers expect students to succeed.

A Need to Shift from a Collection of Unconnected Courses to a Coherent Program of Study

Improving the general and vocational curriculum involves more than vocational teachers emphasizing the academic content of traditional vocational courses and academic teachers finding more ways to teach concepts through an applied process. Improvement also demands more than replacing watered-down, "general" academic courses with more rigorous, "applied" courses, such as applied physics, technical mathematics, applied chemistry, biology, etc. that emphasize higher level academic content. The structure for a new approach involves a shift from offering a fragmented collection of unconnected courses to the development of a coherent

and challenging program of study that combines academic and vocational elements and is designed to prepare students for a double purpose--employment and further education after high school. This means that many high school counselors will have to discontinue their current practice of providing general and vocational students with a high school program of study that represents only the minimum of what is required to graduate from high school.

Blending academic and vocational instruction is not a "quick fix" for the problems of American education, but it has the potential for "toning up" the high school education of general and vocational students. Closing the gap between academic and vocational instruction will require considerable planning, a great deal of staff and curriculum development, and the cooperation and commitment of school boards, principals, counselors, teachers, and vocational administrators. It also will mean working in more effective ways with the business and industrial community so that parents, teachers, and students understand that the ability to use higher level mathematics, science, and communications competencies is essential for employment advancement. Such efforts can result in the following benefits:

- A planned program of study has the potential of providing a structured and purposeful high school experience for those students who traditionally have been allowed to select at random a steady diet of low-level academic and vocational courses. A properly designed program can add purpose and structure to high school experiences while allowing students to keep their options open for further study beyond high school.

- A program of academic and vocational study has the potential to raise academic and technical achievement expectations for students as teachers come to see them as persons capable of greater achievement. Properly implemented, this concept can significantly increase the percentage of students who complete the essential content of what is now the core college preparatory curriculum in English, mathematics, and science.

- A program of vocational and academic study has potential for motivating students to pursue more rigorous academic courses by helping them see the connection between academic and vocational competencies as teachers become more aware of the relationships. Students and teachers will be more motivated as they gain greater insight regarding the educational requirements for succeeding and advancing in the work place and postsecondary education.

- A planned program of study offers the potential for creating a team of vocational and academic teachers who provide the encouragement, support, and extra help needed by students. Such a program, properly implemented, can help students find their own niche in school, doing for them what the college preparatory curriculum does for other students in those programs. Such an approach has proven successful in retaining students who have been identified as potential school dropouts.

The Need for Vocational and Academic Teachers to Work Together

For the new approach to succeed, academic and vocational educators must be equal shareholders. This assertion is made for three reasons. First, the barrier between academic and vocational education is an artificial one, attributable to an educational tradition that places more value on learning for learning's sake than on learning for a purpose. As a thoughtful individual once observed, "If society respects a philosopher, but not the plumber, then neither the philosophy nor the pipes will hold water." Similarly, if we respect the purely academic side of education but not the applied side, the schools will not be educating all of their students. Both academic and vocational educators need to heighten their recognition of the complementary nature of their work.

The second reason for involving both academic and vocational teachers in curriculum integration efforts is based on the ways in which teachers are currently prepared and certified for their profession. All secondary school teachers are specialists--an electronics teacher no less so than a biology teacher. The teacher should know one content field particularly well, along with the pedagogical strategies that work best in transferring that knowledge to students. Thus, mathematics is best taught by trained mathematics teachers and carpentry by experienced journeymen. By working together, teachers will see where their areas of expertise intersect and can help each other. The mathematics teacher can assure that problems to be solved reflect practical, applied situations; conversely, the carpentry teacher can emphasize the many ways that computation or mathematical principles come into play in that trade. Students (and particularly reluctant students) reap the benefits by realizing that, indeed, there is a point to academic knowledge. *We cannot expect students to see the relationship between academic disciplines and problems in a vocational context unless their teachers do.*

Third, successful implementation of a program of vocational and academic study will place new demands on teachers' time. The most promising approaches are those in which the vocational and academic teachers work together to develop new or adapt available curricula, plan courses, and prepare materials for instruction. These activities take time not currently available during the school year. Bringing these two groups of teachers together to develop and implement better alignment of the academic and vocational curriculum, whether they are in the same high school or in an area vocational center and several feeder high schools, will require that schools reduce course loads, provide summer planning activities, and allow for planning and organizational periods free from the press of daily teaching.

The Need to Upgrade High School Graduation Requirements

Raising the quality of all courses and improving the relationship between academic and vocational education will require that high school graduation requirements be tightened to assure that students in the general and vocational curricula complete courses containing higher level academic elements and incorporate advanced study in either a vocational or academic field. High school seniors who have pursued a general academic course of study and who have come later to realize the need for higher level academics express disappointment that the school failed to require them to take higher level mathematics and science courses. A change in graduation standards is essential if future graduates are to have the competencies needed for continued learning in either a work or an educational setting.

## Recommendations for Improving General and Vocational Education in the High Schools

Significant improvements in the mathematics, science, and communication competencies of high school graduates from the general and vocational curriculum *will require that these two curriculum areas are linked and fundamentally changed so as to produce a coherent and challenging high school program of study.* The following recommendations are offered as means for achieving this.

*Improving General and Vocational Education Will Require --*

CLEARLY STATED STATE AND LOCAL SCHOOL BOARD POLICIES ESTABLISHING THAT THE PURPOSE OF VOCATIONAL EDUCATION IS "EDUCATION," A MUCH BROADER CONCEPT THAN "TRAINING."

State and local school boards should adopt a statement of purpose which stresses that the aim of secondary vocational education is to prepare youth for the dual purposes of employment **and** successful continued learning both on the job and in postsecondary education. This means that the focus will be on raising levels of achievement in academic areas for all students and using vocational education as a means of helping students improve their knowledge, skills, and competencies in the areas of communications, mathematics, science, and technology. Furthermore, this shifts the focus of secondary vocational education away from a "training strategy" that focuses only on narrow-based entry jobs to an "educational strategy" aimed at developing individuals with the capacity to think, learn, create, and succeed in a changing workplace. The emphasis would be placed on an instructional approach designed to increase substantially students' use of meaningful academic competencies to grasp work-related content, procedures, and problems in broad occupational or technical fields.

*Improving General and Vocational Education Will Require --*

UPGRADING THE CONTENT OF VOCATIONAL COURSES.

Existing vocational courses need to be revised and new ones developed by significantly expanding the emphasis on advancing the communications, mathematics, and science competencies of students. This change in emphasis will enable vocational programs to provide a mix of technology and transferable occupational competencies that will better serve students with different educational and work goals.

Incorporating related higher level academic content into vocational courses will require states to make substantial investments in curriculum development and instructional materials. In most vocational fields quality materials for teaching academic competencies through vocational courses are not currently available on the commercial market. Without such materials, notable changes in the vocational instructional emphasis will be slow in coming because most vocational

teachers have neither the time nor expertise necessary to develop and prepare quality materials that utilize the context, problems, materials, and procedures of a vocational field for advancing reading, writing, mathematics, and science achievement. Developing this kind of curriculum will require vocational and academic educators to work with persons skilled in preparing instructional materials for students.

The following actions illustrate the scope of curriculum changes needed to upgrade vocational courses:

- Revise existing business education courses or develop new ones as needed, beginning in grade nine, to increase emphasis on writing, composition, reasoning, higher level mathematics, entrepreneurship, and computer-related competencies. Consideration should be given to replacing business English with a business writing course that requires students to compose business reports and letters in response to a variety of work-related situations.

- Revise existing marketing education courses, or develop new ones as needed, to emphasize writing, composition, reasoning, higher level business and computer mathematics, computer science, economics, and international marketing and trade.

- Revise existing agricultural and home economics courses, or develop new ones as needed, beginning in grade nine, to emphasize scientific, technical, and mathematics content and writing and comprehension of technical materials.

- Revise existing health occupation courses or develop new ones to stress science and mathematics content appropriate to health and medical careers and writing and comprehension of technical materials.

- Revise trade and technical offerings at vocational-technical centers or comprehensive high schools to focus on comprehending and preparing written technical materials, advanced level mathematics, and physical and life sciences that underlie different occupational fields of study. Some traditional vocational offerings should be expanded into broader fields of study, such as mechanical technology, electronics, technical graphics, and manufacturing. Outdated programs with limited employment opportunities should be replaced by new broad-based programs--automated manufacturing technology, electronics/electromechanical technology, engineering design technology, health technology, automotive technology, plant and animal technology, for example--that integrate fundamental technical and academic content.

- New links should be established between area vocational centers and feeder high schools through committees composed of academic and vocational teachers, administrators, and representatives from business and industry. These committees would be responsible for developing and implementing a coherent program of study for grades nine through twelve and for coordinating academic and vocational instruction. To link effectively academic and vocational instruction, it may be appropriate in some instances to increase the time students spend at the vocational center and to add to staff academic teachers who would teach the higher level applied courses. Vocational-technical centers should seek to distinguish themselves as "centers of excellence" for using applied learning approaches that advance academic and technical competencies of students.

- States should continue their efforts to redesign the industrial arts curriculum as a technology education curriculum with increased emphasis on using the technology lab to reinforce related mathematics and science concepts and the comprehension of technical materials and written communications.

- New vocational courses should be developed that introduce students to basic technical and academic competencies in the broad fields of computers, electricity/electronics, materials, mechanics, technical graphics, lasers, communications, agriculture and food, biotechnology, medical technology, manufacturing, transportation, etc. These courses enhance students' comprehension of underlying science, mathematics, and technical materials, and provide familiarization with and use of basic technology.

*Improving General and Vocational Education Involves --*

PROVIDING STUDENTS WITH ACCESS TO HIGHER LEVEL ACADEMIC CONTENT TAUGHT THROUGH AN APPLIED APPROACH.

Advances in science, technology, and communications demand that new workers have a literacy level in communications, mathematics, and science equivalent to the essential content of the traditional college preparatory curriculum.

To provide all students with the needed fundamental core of academic competencies will require creating new academic courses that teach higher level content through a functional, applied, or occupationally related approach. Another strategy involves revising existing academic courses so that emphasis shifts to "concrete, hands-on" learning experiences related to students' vocational interests. It is important that the board of education establish as a criterion that the content of new or revised academic courses be equivalent to essential core

elements taught in the language arts, mathematics, and science courses in the college preparatory curriculum. However, each new and revised academic course may draw from more than one traditional academic course.

A parallel action would be to eliminate from the secondary school curriculum those low-level academic courses labeled "general" or "basic" that produce little or no gain in students' academic achievement. They should be replaced by a revised sequence of mathematics and science courses.

Mathematics

It appears that too many vocational and general students spend most of their time in mathematics courses watching the teacher work problems on the chalkboard and then completing paper and pencil drills to practice in a rote manner what they have just seen the teacher do. We need to move away from current instructional methods that appear to focus on the ***repetition*** of rote mechanical skills to an emphasis on actually ***understanding*** mathematical concepts. More innovative forms of instruction are needed, such as group activities and laboratory and homework exercises, that link the application of mathematical concepts and skills to solving real-world problems found in a broad range of jobs. "Hands-on" instructional activities, promoting the use of calculators and computers to perform the mechanical functions of mathematics, are important!

To improve the mathematics achievement of general and vocational students, the following strategies are recommended:

- o Increase emphasis given to instructional strategies that demonstrate the content through incorporating applied and "real life" problems in all mathematics courses in grades seven through twelve.

- o Require a sequence of three mathematics courses for general and vocational students who are not concurrently enrolled in the college preparatory curriculum. One possible sequence of mathematics courses would be:

  Grade 9 -- Pre-Algebra, Applied Technical Mathematics I, or Algebra I
  Grade 10 and/or 11 -- Applied Technical Mathematics, Algebra I, or Geometry
  Grade 11 and/or 12 -- Geometry, Algebra II, or Algebra\Trigonometry

- Provide staff development activities for vocational teachers in mathematical content, the language of mathematics, and instructional methods for integrating and reinforcing mathematical concepts and skills in the context of the vocational courses they teach.

- Provide staff development activities for mathematics teachers in applied teaching techniques, the use of mathematics in vocational courses, and instructional methods for integrating applied teaching strategies into the mathematics curriculum.

- Encourage vocational and mathematics teachers to meet regularly to revise their instructional strategies for integrating mathematics into the vocational curriculum, to improve teaching techniques in mathematics, and to improve the communications and coordination of activities between mathematics and vocational teachers.

Science

It appears that little has been done as a result of the reform movement to improve the quality of science instruction for vocational students. Few science courses afford students the opportunity to engage in laboratory and "hands-on" activities that explore general scientific concepts or link specific scientific concepts and skills to their vocational classes.

Most science teachers believe that laboratory-based classes are the most effective. However, the primary technique for teaching science to general and vocational students continues to be textbook and lecture-discussion with workbook exercises. The desirability of lab-based science courses over textbook-based courses seems to be confirmed by recent assessments of achievement in science by vocational students.

What has traditionally been taught in the science courses taken by general and vocational students may not be sufficient or appropriate for students pursuing vocational studies. It appears that little attention has been given to the content and sequence of science instruction in the various vocational concentrations or to strategies for improving science instruction in both academic and vocational courses. As a result, many youth leave school without the skills and knowledge in science and technology necessary to succeed in an increasingly technological workplace and society.

To improve science achievement for general and vocational students, the following strategies are recommended:

- Science curriculum and instruction in grades seven and eight should include laboratory and "hands-on" experiences.

- A coherent, lab-based sequence of three science courses should be identified for general and vocational students who are not taking the college preparatory sequence of science courses. One possible sequence would be:

  Grade 9 -- a lab-based physical science course
  Grade 10 -- a lab-based biology or life science course
  Grade 11 and/or 12 -- specialty lab-based science courses linked to students' vocational studies; for example, Principles of Technology, Applied Chemistry, Applied Biology, Medical Laboratory Science, Physiology, Botany, Food Science, etc.

- Provide vocational teachers with staff development activities on incorporating related scientific content into their vocational instruction.

- Provide science teachers with staff development activities on applied teaching techniques that will help them link scientific concepts to students' vocational studies.

Reading

Attention to higher-level reading skills should be addressed by all secondary teachers. Schools that are most successful in raising the reading skills of vocational students appear to be those that have moved away from "packaged" reading programs that concentrate on isolated skills to strategies that provide students with a wide range of challenging materials directly related to their vocational and academic studies. The more successful efforts no longer allow watered-down textbooks; rather, comprehensive strategies are developed that will ultimately lead to students' mastery of more complicated materials. Vocational and academic teachers need extensive staff development programs on "reading for learning" in academic and technical fields.

To improve the reading achievement of vocational completers, the following strategies are recommended.

- o Staff development should be provided to assist vocational and academic teachers in developing instructional strategies for advancing students' ability to read and comprehend academic and technical materials.

- o Instruction in remedial reading should be based on the textbooks and other related materials that students must master in their vocational and academic courses, not on watered-down materials that are unrelated to students' coursework.

*Improving General and Vocational Education Involves –*

REQUIRING STUDENTS TO COMPLETE A MORE CHALLENGING AND COHERENT MULTI-YEAR PROGRAM OF VOCATIONAL AND ACADEMIC STUDIES THAT PREPARES THEM FOR CONTINUED LEARNING IN EITHER AN EMPLOYMENT OR EDUCATIONAL SETTING.

State and local school boards should redefine a vocational program as one containing a coherent sequence of academic and vocational courses aimed at preparing students for employment and postsecondary education. In addition, these boards will need to assure that a "vocational completer" is a high school graduate who has completed a prescribed vocational program and demonstrates a satisfactory level of both academic and technical achievement.

The criteria for approval by the board of education should require each local school division to establish for each major vocational field a committee composed of vocational and academic teachers, related employers, and postsecondary education representatives who would be responsible for recommending a program of study.

These committees should be charged with specifying minimum levels of achievement that completers from the vocational program should have in reading, mathematics, and science--for example, scoring at the "adept" level on the National Assessment of Educational Progress (NAEP) reading assessment or scoring at a specific percentile on standardized tests. In addition, the committee must specify the minimum levels of competencies in technical knowledge expected of vocational completers. State departments of education should provide guidelines or models to aid in establishing these minimum standards.

The committee studying the program also should propose a coherent sequence of vocational and academic courses for grades 9-12 for given vocational majors, such as practical nursing, horticulture, secretarial work, or in broad vocational fields, such as business, manufacturing, mechanical trades, construction, hospitality, agriculture, etc. These sequences should be designed to prepare students to enter related employment and provide them with the knowledge and skills necessary to continue to learn in a work and educational setting.

The program of study developed by the committee must:

- Require students to complete at least three credits each in mathematics and science, with at least two credits in each area from courses with content comparable to that in the college preparatory curriculum. All required science courses should emphasize laboratory experiences. Where possible, the proposed mathematics and science courses should be relevant and related to students' vocational majors.

- Require students to complete at least four credits in a vocational concentration and specify the proposed sequence of specialty courses.

- Require students to complete at least two credits in related vocational studies. These courses should be drawn from a list of courses designed to introduce students to technical competencies that are generic to a broad range of occupational and technical fields, such as basic electricity/electronics, computers, technical graphics/drafting, accounting, technical/business writing, manufacturing, mechanics, material science, agriculture, and food science, etc. Related study requirements for all vocational completers should include one-half credit in a computer course that teaches keyboarding and basic computer application.

These criteria were used recently by a committee of academic and vocational teachers and administrators to develop programs of vocational and academic study. Four examples of programs of study developed by this committee are contained in the Appendix. These curricula illustrate how a coherent and sequential program of vocational and academic study can be developed that will open, rather than close, future options while providing the context of an occupational study as the vehicle for relating the teaching of a core academic curriculum. The automotive program of study illustrates how a planned program of at least two credits of vocational study each year can be combined with more rigorous academic subjects. Rather

than wait until the 11th grade to start their vocational major, some students will need to do so earlier in order to see a connection between school studies and their goal.

*Improving General and Vocational Education Involves –*

PROVIDING UNDERACHIEVING STUDENTS WITH ACCESS TO REWARDING AND DEMANDING VOCATIONAL PROGRAMS AND ACADEMIC COURSES AND THE CONTINUED EXTRA ASSISTANCE THEY NEED TO SUCCEED.

State funding and policy initiatives will be needed to:

- Discontinue low-level vocational courses that seek to train students for entry-level jobs with no clear path for career advancement. Furthermore, all existing vocational programs that cannot be justified by successful placement rates of at least 70 percent in related employment, military, or postsecondary education should be replaced.

- Assure that all students, especially underachieving and poorly motivated students, in all systems have access to a comprehensive range of challenging vocational programs in fields with good opportunities for future employment and education. Local school districts must consider options for expanding students' access to high-quality vocational programs that include: supervised occupational experience, such as cooperative education, apprenticeship, internship; mentorship and enrollment programs with postsecondary institutions; shared time vocational centers; magnet schools, etc.

- Revise all vocational education curricula so that the content is congruent with labor market needs.

- Require local school districts to identify underachieving students upon their entrance into high school. The identification process should include a comprehensive educational and interest assessment that enables these students, their parents, and the school to work together in planning and assuring that all students are enrolled in a challenging program of vocational and academic study.

- Enable local school districts to provide underachieving students with the extra help needed on a continuing basis to master required academic and technical competencies. Help may take many forms, such as bi-weekly coaching classes, weekly Saturday schools, daily or weekly parental involvement in learning activities at home, weekly peer tutoring, summer school, or a combination of these kinds of practices to give more

assistance, time, and support to students who lack key skills, fail tests, or are at risk of falling behind in grade level.

- Require school principals and vocational administrators to establish teams of teachers who are committed to coordinating academic and vocational instruction so that underachieving students will be successful in advancing their academic and technical competencies. Underachieving students need to know that the school and their teachers believe they can succeed and will be assisted in doing so.

*Improving General and Vocational Education Involves --*

DEVELOPING THE LINKAGE BETWEEN SECONDARY AND POSTSECONDARY EDUCATION AND TRAINING SO THAT ACADEMIC AND VOCATIONAL COURSES ENABLE STUDENTS TO PURSUE FURTHER EDUCATION SUCCESSFULLY.

To increase the percentage of graduates who pursue study beyond high school, the board of education should require that all approved secondary vocational and academic programs of study be part of either a formal articulation agreement or a "two-plus-two" program plan with either a postsecondary institution or other recognized training program.

The challenge here is to create state policies that encourage representatives from high schools, postsecondary institutions, and business and industry to work together in planning a four-year high school curriculum that is connected with a planned advanced program of study in either an institutional setting or in the work place. The planned curriculum would include both academic and technical courses.

*Improving General and Vocational Education Involves --*

PROVIDING STUDENTS WITH ASSISTANCE IN COURSE SELECTION AND PLANNING.

Beginning no later than grade eight, students should receive, on at least an annual basis, educational, career, interest, and attitude assessment information to assist them in planning and pursuing a meaningful four-year educational plan. This does not mean students should be forced to follow it blindly or be unable to change the path. However, if change is indicated, students should be given special attention. At present, too many students in the

general track are just left on their own to select from a course "cafeteria" of equally poor fare. Students and their parents or guardians should meet with a guidance counselor annually to review, update, or alter the four-year plan as students refine their interests and goals. A planned assessment and counseling program can build students' confidence in their unique abilities and can help affirm their pursuit of a more rigorous program of academic and vocational study.

State accreditation standards should require local school districts to provide assessment and counseling services aimed at assisting all students in planning a program of high school studies that will prepare them for both employment and postsecondary education. Improved course selection and planning can have an enormous influence on raising students' achievement in the basic competencies and level of motivation.

Information collected by the SREB-State Vocational Education Consortium reveals the following inadequacies in the present system of assessment and counseling for students in the general and vocational curriculum.

- o About half the students indicated that they had not received help from their counselors in developing a four-year plan.
- o Most students indicated that they had not been encouraged to take higher level academic courses that complement their vocational intent.
- o Only a few schools have developed a plan to assist students in pursuing a coherent and challenging program of vocational and academic study.
- o Only two percent of the students credit their vocational teachers with providing assistance in the selection of mathematics and science courses;
- o Seventy percent of vocational teachers spend less than two hours annually working with counselors or students on educational plans;
- o Only 15 percent of students reported that they and their parents met together with school personnel in developing a four-year educational plan.

At the same time, those graduating seniors who *had received* special aptitude and interest assessment and counseling often referred to this as a significant event in establishing their confidence and in affirming their commitment to pursue a more rigorous program of

vocational and academic study. It is essential that secondary school leaders recognize how important an effective guidance program can be in improving general and vocational students' commitment to higher achievement.

*Improving General and Vocational Education Will Require –*

STAFF DEVELOPMENT PROGRAMS TO PROMOTE THE ACADEMIC COMPETENCIES OF VOCATIONAL TEACHERS AND THE APPLIED TEACHING SKILLS OF ACADEMIC TEACHERS.

An investment will be required in staff development activities designed to: (a) assist vocational teachers in upgrading their academic knowledge and their ability to use teaching methods that blend academic and vocational studies; (b) assist academic teachers in devising learning experiences that help students see the connection between communications, mathematics, and science skills and jobs; (c) assist counselors and administrators in rethinking strategies for raising the rigor and status of a combined vocational and academic program of study to a level comparable to that of the college preparatory program. In addition, all secondary teachers--academic and vocational--need help in devising ways to strengthen students' reading and writing skills for learning in content fields. One of the state criteria for approving a vocational program in the future should be evidence that vocational and academic teachers have participated in staff development activities to upgrade their knowledge and skills for improving the basic competencies of vocational completers.

*Improving General and Vocational Education Will Require –*

REVISING THE PREPARATION AND CERTIFICATION REQUIREMENTS FOR NEW VOCATIONAL TEACHERS.

Vocational teachers of the future must have mastery of both the technical competencies in their vocational discipline and the academic competencies that underlie their specialty. In addition, they must master teaching methods that connect needed academic competencies with related technical knowledge and skills. This will require the revision of teacher education programs so that greater emphasis is placed on strengthening the academic base of the vocational teaching fields. Changes will also be required in professional education courses to

give greater emphasis to the teaching of related reading, writing, mathematics, and science competencies with natural ties to a vocational major. The content of vocational teaching courses will need to be revised to emphasize the contributions of the underlying academic disciplines.

As a goal, state and teacher education leaders should establish a process for determining the changes needed in teacher preparation and certification to achieve a new type of secondary vocational program. If the state elects to continue the practice of employing vocational teachers who do not have a college degree, an immediate goal should be set to certify only those who demonstrate the ability to do college-level academic work. In addition, the board of education should require existing and new non-degree vocational teachers to complete a degree within a designated number of years and to make minimum progress each year toward the goal. This should not be the same old teacher education program, but new programs aimed at broadening their academic and technical competencies and their ability to integrate academic and vocational content.

Finally, the boards of education should do what many states did during the 1950s for elementary school teachers--that is, establish as a long-term goal that by a designated date all full-time vocational teachers will have a college degree. Such a goal must be coupled with the development of new approaches for recruitment, financial aid, and preparation of teachers for those fields that have been or may be initially filled by non-degree persons.

*Improving General and Vocational Education Entails --*

EXPANDING EFFORTS TO PLACE GRADUATES IN RELATED EMPLOYMENT OR IN POSTSECONDARY EDUCATIONAL OPPORTUNITIES THAT MAKE FULL USE OF THEIR VOCATIONAL AND ACADEMIC TRAINING.

Every high school student should graduate with established "next step" career and educational goals. A majority of high school graduates who reported that they had obtained employment which was related to their vocational program acknowledged assistance from their vocational teachers. High school graduates who obtain employment related to their vocational

studies have significantly higher annual earnings than others who may "just get a job" directly upon graduation. Encouraging vocational teaches to include placement activities in their responsibilities could increase measurably the success of graduating seniors.

Placing more students in jobs that use the skills acquired in high school will require creating or enlarging job placement centers, increasing contacts between vocational teachers and potential employers, and establishing organizational arrangements with local employers who share the responsibility for linking high school students with good jobs. Some school districts improve job and educational placement services by employing vocational teachers for an "extended year."

Motivating some students to pursue a more rigorous program of academic and vocational studies will be effective only if students see the reward of a better paying job as the end result. Information from a recent survey of over 1,700 vocational graduates in 13 southern states one year after high school graduation revealed that there is no difference in the salary of students in the lower quartile in mathematics, science, and reading and the salary of those in the upper quartile. Without believable evidence of such a payoff, some students will be unwilling to make the extra effort. Each school district should be required to have a business and employer partnership council that develops information on the tangible benefits accruing to students who successfully pursue a challenging program of study.

More specifically, this council should obtain commitment from the school and employers to cooperate in:

- Providing paid summer internship experiences for students who excel in communications, mathematics, science, and vocational studies;
- Providing grants for further study to students who excel in their academic and vocational studies;
- Making available in a timely manner an easily understood high school transcript that can be an integral part of the employment process;
- Paying a higher wage to those graduates who successfully complete a more rigorous program of vocational and academic study.

*Improving General and Vocational Education Requires--*

ESTABLISHING PERFORMANCE INDICATORS TO TRACK AND REPORT THE ANNUAL PROGRESS OF EACH SCHOOL DISTRICT.

To track progress on increasing the basic competencies of general and vocational students, indicators should be established to measure performance in the following four main areas.

- o Academic achievement--Possible indicators of improved academic achievement would include:
  - * Raising the basic reading, mathematics, and science competencies of students who complete secondary vocational and general programs of study to the 50th national percentile or higher, as measured by programs such as the National Assessment of Educational Progress, or by significant gains in the academic achievement of students in relation to prior achievement;
  - * Increasing the percentage of students who demonstrate literacy levels needed for the present and future work place;
  - * Increasing annually the percentage of students who have taken two or more college preparatory mathematics courses, two or more college preparatory science courses, or courses specifically designed to teach similar content in an applied context;
  - * Increasing the percentage of students completing a coherent program of academic and vocational education.
- o Vocational attainment and technical achievement--Possible indicators for improving vocational attainment and technical achievement would include:
  - * Establishing targets for the percentage of students who complete vocational programs and are successfully placed in related jobs, the military, or pursue further education (for example, a state target of 80 percent or more may be a desirable goal);
  - * Establishing achievement cut-off scores on technical competencies for each vocational field and increasing annually the percentage of high school graduates meeting the minimum scores;
  - * Increasing the rate of high school attendance and raising the rate of graduation from high school to 9 of 10 who begin high school;

* Increasing the percentage of students who indicate there is reinforcement of academic topics in vocational courses;

* Increasing the percentage of vocational courses meeting state standards for reinforcement of academic competencies and establishing standards for comprehensive vocational offerings that each school district should provide.

o Employment outcomes--Possible indicators for improved employment outcomes would include: tracking employment experiences over time, including earnings and career advancement of vocational course takers; checking on skill levels of jobs obtained; and determining student and employer satisfaction.

o Postsecondary continuation and attainment--Possible indicators for improved postsecondary continuation would include:

* Increasing to 50 percent the number of students who complete a planned vocational and academic program and continue their education within one year after high school graduation;

* Increasing to 50 percent or above (national average is now about 30 percent) the percentage of students from the general and vocational curriculum who enter and complete a postsecondary educational program within four years after high school graduation;

* Increasing the percentage of high school graduates with a "match" between their high school and post-high school vocational credits.

Establishing performance indicators will serve three main purposes. First, publicly announcing the indicators will assist state officials in assuring that the public and educators are aware of the goals and directions for the improvement of general and vocational education. Strategies can be modified as improvement proceeds. The information derived from the indicators will help answer questions from educational officials, legislators, governors, teachers, and others about what the new general and vocational program is accomplishing and help clarify what it is expected to accomplish. Second, the publication and distribution of information about the performance of high school graduates will challenge schools to improve performance of other students. Ultimately, the information can provide a rational basis for allocating federal and/or state resources to improve performance. Third, reliable performance information can fuel the public's demand for serious program improvement and increase public willingness to provide

the resources to accomplish that improvement. Finding ways to measure directly or adequately the gains in students' academic achievement and technical competencies is not easy or without additional costs. Developing, using, and reporting results should be major elements in the plan for positive change.

## Implementation Strategy for Improving General and Vocational Education in the High Schools

The recommendations for advancing the academic and technical competencies of high school graduates by improving general and vocational education have seven main objectives:

(1) Establishing a goal of higher expectations for vocational and academic education;

(2) Fostering curricular and instructional improvement of vocational and academic education;

(3) Assuring high school students access to a comprehensive range of vocational offerings that reflect current and future employment opportunities;

(4) Providing continuous extra assistance needed by underachieving students to succeed;

(5) Developing linkages between the high school and employers and between the high school and postsecondary education and training;

(6) Providing students with assistance in course selection and educational planning;

(7) Assessing, tracking, and reporting annually the progress being made by school districts on key performance indicators.

Improving vocational and general education will require state boards of education to send a clear signal of intent to move forward. The following five action steps by state boards of education do not include all that needs to be done, but represent minimum actions for establishing a clear direction and expressing serious intent to "stay the course."

*Improving General and Vocational Education Will Require --*

STATE BOARDS OF EDUCATION TO ADOPT AN AFFIRMATIVE STATEMENT EXPRESSING INTENT TO MAKE NEEDED CHANGES IN GENERAL AND VOCATIONAL EDUCATION.

Boards of education should adopt a policy expressing their intent to improve dramatically the academic competencies of high school students graduating from the general and vocational curriculum. The policy statement of intent should explain why there is a need to improve general and vocational education, the goal and key target objectives, and the direction school districts should pursue. Such a statement should provide the framework for state and local educational leaders to begin the planning necessary for implementing an upgraded program of vocational and academic studies.

*Improving General and Vocational Education Will Require --*

STATE BOARDS OF EDUCATION TO UPGRADE THE HIGH SCHOOL GRADUATION REQUIREMENTS FOR THE HIGH SCHOOL GRADUATING CLASS OF 1996.

Educational systems in SREB states compare favorably with outstanding school systems in the nation, in many respects, but more must be done if students are to be equipped with the knowledge and skills needed for the 21st century. For SREB states to have public school systems that are among the nation's best in all areas, they must sustain the momentum to better educate students and move beyond current minimum standards. One way to do this is to require students to take more demanding high school courses. Each SREB state should seriously consider revising the requirements for awarding high school diplomas so that they more accurately reflect current and anticipated needs of students and the region's economy.

The high school graduation requirements found on page 27 are recommended to assure that all students pursue either a more challenging and coherent program of academic and vocational studies or in-depth study in an academic field.

RECOMMENDED HIGH SCHOOL GRADUATION REQUIREMENTS

| Subject Area | Number of Units |
|---|---|
| English | 4 |
| Mathematics (meet specified requirements) | 3 |
| Laboratory Science (meet specified requirements) | 3 |
| Social Studies | 3 |
| U.S. History | |
| U.S. Government and Economics | |
| World History and Geography | |
| Vocational or Academic Major (meet one of four options) | 6 |
| Health and Physical Education | 1 |
| Fine Arts or Practical Arts | 1 |
| Electives | 3 |
| Total Units | 24 |

Minimum mathematics requirements for students would include two mathematics credits at the level of Algebra I and above, or two mathematics credits in courses specifically designed to teach similar content through an applied or functional process.

Minimum science requirements for students would include two lab science credits at the Biology I, Chemistry I, or Physics I level or above, or science courses designed to teach similar content through an applied or functional process.

Minimum requirements for a vocational or academic major could be met by students completing a planned program of study with one of the following four options:

(1) Complete requirements for a college preparatory curriculum or special recognition diploma or certificate;

(2) Complete an approved program of vocational and academic study that consists of at least 4 credits in a vocational major and two related vocational credits from the broad fields of technology, such as computers, electricity/electronics, mechanics, technical graphics, lasers, communications, agriculture and food, biotechnology, medical technology, manufacturing, transportation, etc.

(3) Complete an approved program of vocational and academic study which consists of at least three credits in each of two different vocational majors;

(4) Complete two additional higher level mathematics and science credits and four credits of advanced courses from the following fields: English, social studies, foreign language, fine arts, or vocational education major. All academic credits for the fourth option, except for fine arts and vocational education, to be earned in courses either from the college preparatory curriculum or from courses with similar content or rigor.

Each of these options requires students to complete, either before or during high school, an equivalent one-half unit credit in a computer course that emphasizes keyboarding and computer use skills.

In addition to advancing their reading, writing and speaking skills and their knowledge of the English language, the language arts sequence for students pursuing a vocational major should enable them to appreciate our common literary heritage. These students must encounter, in depth, enduring works of literature. These students are capable of learning about and reflecting upon basic questions and dilemmas posed in great literature and merit the opportunity to acquire this knowledge.

Students pursuing a vocational major should be exposed to an in-depth study of U.S. history and government. These students need an understanding of the themes that continue to shape American lives.

It should be possible for high school graduates who choose to do so to complete both a college preparatory and vocational program of study. These requirements are designed to assure that all high school graduates receive stronger academic preparation and the opportunity for in-depth study in a field of their choosing.

*Improving General and Vocational Education Will Require --*

THE STATE DEPARTMENT OF EDUCATION TO ESTABLISH STATE TEAMS COMPOSED OF VOCATIONAL AND ACADEMIC EDUCATORS TO PROVIDE TECHNICAL ASSISTANCE TO LOCAL SCHOOL DIVISIONS.

State vocational and academic leaders must work together to assist school districts in planning and implementing the agenda for improving general and vocational education. The creation of interdisciplinary state teams to offer technical assistance would demonstrate the state commitment to blending vocational and academic education into an improved new approach. Among the activities to be performed by state technical assistance teams would be:

- o Conducting awareness conferences for school district personnel on the need for a new approach for improving vocational and general education.

- o Assisting school districts to develop plans for upgrading vocational and academic courses and combining them into a coherent, challenging, and structured program of studies preparing students for a postsecondary associate degree or certificate and/or employment in a specific career field upon high school graduation.

- o Monitoring projects and grants to improve quality and effectiveness of vocational and academic instruction by revising vocational and academic curriculum and instructional material, teacher education, staff development, and other developmental activities.

- o Assisting school districts to replace or revise vocational programs that fail to fulfill adequately the dual purpose of preparation for employment and for further learning.

- o Assisting school districts to create institutional arrangements for delivery of new programs of vocational and academic studies.

- o Assisting school districts to provide the continued extra assistance that underachieving students need to master required technical and academic competencies.

- o Strengthening guidance services to assist students in planning for and successfully pursuing their planned program of vocational and academic studies.

*Improving General and Vocational Education Will Require --*

THE STATE DEPARTMENT OF EDUCATION TO ESTABLISH A RESEARCH AND EVALUATION EFFORT RESPONSIBLE FOR A COMPREHENSIVE SYSTEM TO ASSESS STUDENT PERFORMANCE.

State and local school districts need information annually on progress being made in advancing the basic competencies of high school graduates pursuing each of the four curriculum options. A research and evaluation effort should be established with clear responsibility for designing an assessment system, developing or selecting tests, preparing data collection instruments, collecting information, compiling and analyzing findings, and preparing annually a report to be presented to the state board of education, school districts, and the public at large.

*Improving General and Vocational Education Will Require --*

THE PROVISION OF NECESSARY RESOURCES FOR ACHIEVING THE GOAL OF IMPROVED VOCATIONAL AND GENERAL EDUCATION.

Improving vocational and general education will require increased state and local dollars. The state board of education should commit the use of federal vocational education dollars and additional state dollars toward achieving the goal of improving general and vocational education.

## Conclusion

For the past several years, SREB states have made concerted efforts to stimulate their economic base by encouraging businesses and industries to locate in their states. A major requirement of these corporations is access to an educated work force and a strong educational system. To assure that the citizens of this region can meet the demands of employers, it is imperative that current vocational and general education programs be improved. New scientific and technological discoveries are being made almost daily, and it has become virtually impossible to predict in detail the advances that will occur in business and industrial operations in the years ahead. One thing is certain, however: The need for well-educated personnel--people who can read and interpret instructions and apply them to the work at hand--will continue to escalate. This leads to the conclusion that all graduates of all high schools must be better prepared academically and technically to assume meaningful positions in the work world of tomorrow and benefit from further training in a work or educational setting. To assure that our youth are prepared, action must be taken--and taken immediately--to make changes assuring that strong programs combining academic and vocational education are available to high school youth across SREB states.

Some may read this document as an effort to "vocationalize" the total high school curriculum. This is not the case. The recommendations require no more units in vocational courses than students take currently. They do call for strengthening the academic content of vocational course offerings and for more and higher level academic courses that form a planned program of vocational and academic study. To accomplish this, there must be a strong team

effort by teachers of both academic and vocational courses. Fundamentally, all that has been proposed rests on the belief that every student receiving a high school diploma should study some vocational or academic area in depth. Finally, the proposal represents the belief that current amorphous and feeble general programs no longer have value for anyone--they fill time but not minds. *The central goal must be to raise the academic and technological literacy of high school graduates by advancing their knowledge and skills in communications, mathematics, and science and their capacity to use this increased knowledge to solve increasingly complex problems in broad occupational fields.*

## Automotive Curriculum

### Grade 9

| | No. of Credits |
|---|---|
| English | 1 |
| Technical Mathematics I (lab) | 1 |
| Biology (lab based) | 1 |
| Physical Education/Health | 1 |
| Computer Literacy and Keyboardin | 1/2 |
| Introduction to Automobile Mechan | 1 |
| Basic Mechanical Drawing | 1/2 |

### Grade 10

| | |
|---|---|
| English II | 1 |
| Technical Mathematics II (lab) | 1 |
| Applied Physics I (lab based) | 1 |
| Government and Economics | 1 |
| Basic Electronics | 1 |
| Auto Mechanics I | 1 |

### Grade 11

| | No. of Credits |
|---|---|
| English III | 1 |
| American History | 1 |
| Auto Electronics | 1 |
| Auto Mechanics II | 1 |
| Applied Physics II or Chemistry (lab based) | 1 |
| Elective | 1 |

### Grade 12

| | |
|---|---|
| Technical Writing and Communicat | 1/2 |
| English Literature and Composition | 1/2 |
| Auto Mechanics III | 2 |
| World History and Geography | 1 |
| Algebra II | 1 |
| Elective | 1 |

Suggested elective options for electives:
Foreign Language (2); Mathematics (1); Accounting (1); Speech (1); Psychology (1); Computer Applications in Business (1); Auto Technology Systems (Fluid Power, heating, cooling, etc.) (1); Technical Graphics (1).

## Health and Related Fields

| Grade 9 | No. of Credits |
|---|---|
| English I | 1 |
| Algebra I, Pre-Algebra, or Technical Mathematics I | 1 |
| Laboratory Physical Science I | 1 |
| Keyboarding and Computer Literacy | 1/2 |
| American History | 1 |
| Physical Education/Health | 1 |
| Introduction to Health Occupations and Sciences | 1/2 |

| Grade 10 | |
|---|---|
| English II | 1 |
| Algebra II, Pre-Algebra, or Technical Mathematics II (principles) | 1 |
| Laboratory Science II (Applied Biology) | 1 |
| Word Processing | 1 |
| Anatomy and Physiology I | 1 |
| Elective | 1 |

| Grade 11 | No. of Credits |
|---|---|
| English III | 1 |
| Laboratory Science III (Applied Chemistry) | 1 |
| World History and Geography | 1 |
| Medical Lab Science I | 1 |
| Anatomy and Physiology II | 1 |
| Machining II | 1 |
| Elective | 1 |

| Grade 12 | |
|---|---|
| Technical Writing | 1/2 |
| English IV | 1/2 |
| Algebra II | 1 |
| Government and Economics | 1 |
| Medical Lab Science I | 1 |
| Patient Care | 1 |
| Elective | 1 |

Suggested options for electives:
Foreign Language (2); Advanced Mathematics (1); Psychology (1); Business Writing and Communications (1); Computer Applications (1); Internship (1)

## Secretarial and Administrative Support

| Grade 9 | No. of Credits |
|---|---|
| English I | 1 |
| Government and Economics | 1 |
| Algebra I, Pre-Algebra, or Technical Mathematics I | 1 |
| Laboratory Science I (Physical Science) | 1 |
| Physical Education/Health | 1 |
| Computer Literacy/Keyboarding | 1/2 |
| General Business | 1/2 |

| Grade 10 | |
|---|---|
| English II | 1 |
| Algebra II, Geometry, or Technical Mathematics I | 1 |
| Laboratory Science II (Biology) | 1 |
| American History | 1 |
| Keyboarding Applications | 1 |
| Elective | 1 |

| Grade 11 | No. of Credits |
|---|---|
| English III | 1 |
| World History and Geography | 1 |
| Laboratory Science III (Applied Biology or Physics) | 1 |
| Word Processing | 1 |
| Business Writing | 1 |
| Elective | 1 |

| Grade 12 | |
|---|---|
| English IV | 1 |
| Algebra II/Trigonometry | 1 |
| Office Systems | 1 |
| Business Computer Applications | 1 |
| Cooperative Education | 1 |
| Elective | 1 |

Suggested options for electives:
Applied Mathematics (1); Foreign Language (2); Accounting I (1); Computer Science (1); Business Law and Economics (1); Technical Graphics (1); Desk-top Publishing (1)

## Manufacturing Production Trades

| Grade 9 | No. of Credits |
|---|---|
| English I | 1 |
| Algebra I, Pre-Algebra, or Technical Mathematics I | 1 |
| Laboratory Science I (Physical Science) | 1 |
| Physical Education/Health | 1 |
| Introduction to Technology | 1 |
| Keyboarding/Computer Applications | 1/2 |
| Basic Mechanical Drawing and Blueprint Reading | 1/2 |

| Grade 10 | |
|---|---|
| English II | 1 |
| Algebra I, Pre-Algebra, or Technical Mathematics II | 1 |
| Laboratory Science II (Applied Biology/Ch | 1 |
| American History | 1 |
| Introduction to Machining I | 1 |
| Elective | 1 |

| Grade 11 | No. of Credits |
|---|---|
| English III | 1 |
| Government and Economics | 1 |
| Laboratory Science III (Applied Physics Principles of Technology) | 1 |
| Machining II | 1 |
| Science and Properties of Materials | 1 |
| Elective | 1 |

| Grade 12 | |
|---|---|
| English IV | 1 |
| Algebra II/Trigonometry | 1 |
| World History and Geography | 1 |
| Elective | 1 |
| Programmable Control and Robotics | 1 |
| Robotics and Automated Manufacturing Advanced Machining | 1 |

Suggested elective options for:

(a) Postsecondary Education: Applied Physics II (Principles of Technology) (1); Foreign Language (2);
(b) Employment: On-job training (1); Fundamentals, Electricity and Electronics (1/2); Drafting (1); Introduction to Mechanical Design (1/2); Advanced Machining (1).